

imported from *Rungpur*; it appears to be more cottony than the tussur, and to make a web warmer and softer than the tussur cloth, but it is not so strong.

The cocoons called *haumpottonee* are unknown to us in *Bengal*, and appear to be of small value both as to quantity and texture: moreover I imagine it would be very difficult to reel them into thread.

The *deo mooga* cocoons are very small but are fine and soft, and when fresh would yield, I doubt not, a very delicate white thread: they are smaller than our *dèsee* (country) cocoon.

The specimen of country worm silk is very fair, and if dressed would be quite equal to our *Patna* thread, from which korahs and other silk piece goods are made.

The specimen of iron reel (or station method) is very good, indeed, equal to our best native filature letter A: the thread is even, soft, sound and remarkably strong, so that it may be well ranked with our best second quality from the filatures of *Bengal*.

IV.—On the indigenous Silkworms of India. By T. W. HELFER, M. D. Member of the Medical Faculties at the Universities in Prague and Pavia, Member of the Entom. Society in Paris, &c.

[Read at the Meeting of the 4th December.]

Silk was in all times an article of the greatest importance throughout the ancient world.

China gained its celebrity in the classical time of the ancients, as the mother-country of that mysterious texture, which it manufactured from time immemorial, with a high degree of perfection, and called *se* or *ser*; whence all India and its eastern unknown boundaries derived the name *Serira*.

It made the satraps of the western world, the rulers of *Rome* and the emperors of *Byzant*, envious of its possession, and the home brought golden fleece of the fabulous Argonauts, was perhaps nothing else than the precious web of the *Bombykia*.

The emperor JUSTINIANUS got an insight into the secret by two adventurous Persian monks, who brought the eggs of the Chinese silkworm in a hollow bamboo cane, safe over the icy chains of the *Himálaya*, the barren plains of *Bokhara*, and the ruggy mountains of *Persia*, to the distant eastern capital. He considered it a point of great importance to reserve to himself the monopoly of such a precious article, though master of the riches of his vast empire.

The Sicilians in the time of ROGER the first, became a wealthy people by its introduction into *Palermo*—the Venetians were enabled by the trade of silk chiefly, to build their immortal maritime bulwark, and in our days the introduction and manufacture of silkworms is a source of unlimited riches to the countries of *Europe*, where it is cultivated on a large scale.

To elucidate this it may be observed, that *France* alone exported in the year 1820, wrought silk to the value of more than 123 millions of francs.

The importation of raw and worked silk into *England*, amounted to 4,547,812 pounds in the year 1828, of which about 1,500,000 pounds were brought from *Bengal*, 3,047,000 pounds were, therefore, brought from foreign countries, chiefly *Italy* and *Turkey*.

The northern parts of *Europe* and chiefly *England* are less suited for its cultivation on account of climate.

Great Britain, *France* and *Germany*, finding by experience, that the demand is constantly greater than the supply, resorted to different substitutes.

Different substances presenting analogies to that beautiful filament were examined. The spider's web was tried in *France*, first by Mr. BON: but Mr. REAUMUR found that the war-like propensities of the *Arachnidæ* hindered their being reared in great numbers, and this enterprize has been in our days entirely abandoned.

Men resorted to the *Mollusca* and found that the maritime *pinna* gives a filament like silk, having the power to produce a viscid matter which it spins round the body. A beautiful and very durable silk was produced from it, the *Byssus* of the ancients, but it was always dearer than the common silk of the *Bombyx mori*, and though to this day caps, gloves and stockings are woven from it in *Calabria* in *Sicily* (I saw myself a considerable manufacture of it in *Palermo*), it will probably remain for ever a matter of curiosity rather than an article of general use.

In *Germany* endeavours have been made in the time of ROESET, and recently in *Styria*, to make silk from the cocoons of the *Saturnia pyri*, a moth which is common in *Austria* and in the subalpine parts of the *Tyrol* and *Switzerland*: but hitherto the experiments have been too few; more particularly, as I heard, on account of the delicate caterpillar, which dies if not fed with the greatest promptitude with the under leaves of different kinds of pear trees.

A discovery, therefore, which promises to prove not so abortive as those now quoted, must be of the greatest importance.

The vast provinces of *India* are rivalled in variety, preciousness

and perfection of their productions, only by those of the celestial empire. Now in the hands of an enlightened benevolent government, they will probably surpass it in a short time, when its natural resources, daily more conspicuous, shall be discovered, examined, and brought in to general use.

As in *China*, so in India, silk has been produced since time immemorial: not the silk of the later introduced mulberry caterpillar, but the silk from various indigenous cocoons, which are found only and exclusively here.

The first notice of these, but only in a cursory way, has been given by the father of Indian botany, Dr. ROXBURGH, in the Transactions of the Linnæan Society, vol. vii.

He there mentioned only two species, the *Phalena (Attacus) (Saturnia) paphia* and *Phalena cynthia*. Since that time no further attention has been paid to this subject except that Dr. BUCHANAN, in his description of the district of *Dinajpur*, says, that another silkworm is reared on the castor oil plant for the domestic use of the natives.

From the moment of my arrival in India, I had paid an unremitted zealous attention to the productions of Botany and Zoology, and had been so happy to identify in the course of two months, two other species of the genus *Saturnia* which yield silk, one from *Silhet* the other from *Bankoora*. Just at this time Mr. JAMES PRINSEP received from Captain JENKINS in *Assam*, a memoir by Mr. HUGON on the silkworms of that newly acquired, remarkable province, establishing six different kinds of silkworm: the cocoons of four of which are now transformed into silk by the inhabitants of *Assam*, and to my great joy and surprise, I found that three of them are different from the well known *Bombyx mori*, and from the two other indigenous which are worked in Bengal.

These recent discoveries merit particular attention. India has thus the internal means of providing the whole of *Europe* with a material which would rival cotton and woollen cloth, and would be preferred in many cases to both, if brought within the reach of every one by a lower price: and an unlimited resource of riches and revenue might be opened under proper management.

May it be now permitted to me to go through the numerous different species of India which actually produce silk of which seven kinds have never been mentioned before.

1. *Bombyx mori*, the mulberry silkworm, which has been probably introduced as the mulberry seems to be an acclimated plant, is too well known to deserve a particular mention.

2. The wild silkworm of the Central provinces, being described

as a moth not larger than the *Bombyx mori*. I could not yet procure specimens of it : probably there are several species of *Bombyx* confused, as the silk, which sometimes comes in trade, varies considerably.

3. The Joree silkworm, *Bombyx religiosæ*, mihi.—I am sorry to say that the specimens of this interesting moth have been destroyed on their way from *Assam* to *Calcutta*, so that I am obliged to make a superficial description from the accompanying drawing. (Pl. VI.) excluding a diagnostical analysis.

Genus, Bombyx.

Length about $1\frac{1}{4}$ of an inch.

Antennæ, pectinated.

Head, small, covered.

Eyes, very large, brownish black.

Palpi, unknown.

Thorax, subquadrate, covered with thick brownish grey hair, with a black band separating the abdomen from the thorax.

Abdomen, represented as having eight segments?

Legs, unknown.

Wings, upper wings very short (in ♀ imperfect) triangular, with the acute angle outward. The interior side emarginated. Of a light grey color which darkens towards the extremity.

An interrupted whitish band on the lower margin with a large whitish speck towards the ends.

Lower wings uniformly brown.

The cocoon of this silkworm shows the finest filament, and has very much silky lustre. It is exceedingly smooth to the touch and very different from the cocoon of the mulberry tree.

This discovery of Capt. JENKINS is very interesting, as it yields a silk if not superior yet certainly equal to that of *Bombyx mori*.

It lives upon the pipul tree, (*Ficus religiosa*.) Its general introduction would be very easy, as the pipul tree grows abundantly over all India.

Specimens of cocoons sent a second time by Captain JENKINS, convince me that the *Joree* and *Deo-mooga* are the same species.

4. *Saturnia Silhetica*, mihi. (Longitudo pollices novem, sive lineas 108 alarum superiorum expansarum.)

Diagnosis. Pectinicornis, alis superioribus apice recurvata falcatis, inferioribus oblongis. Alis superioribus maculis duabus fenestralibus, internâ triangulari magnâ alterâ externâ multo minori oblongâ, inferioribus maculâ eâdem unâ versus corpus triangulari magnâ. Colore cinamomeis lineis variegater albidis in medio ad marginem externam flavis.

Eggs, larva, and chrysalis, unknown.

Imago. Description.

Head, projecting with a crest of yellow hairs.

Eyes, middle-sized, light brown.

Antennæ, pectinated, about five lines broad, yellow.

Palpi, four, not covering the inner vermilar, brownish colored.

Mouth, hidden, without proboscis.

Thorax, obovate, clothed in a velvet-like purplish fine hair of the same color as the wings.

Abdomen, very short, clothed with much finer and lighter hair than the thorax.

Legs, hairy, yellow, equal.

Tarsi, moderately incurved.

Wings, horizontal expanded, with strong ramifications of the central muscles and tendons.—*Superior pair* of a cinnamon color. The end much curved, the upper margin with a beautiful velvet-like grey belt. Fan edges very much concave, the exterior extremity of a beautiful rose color. The inferior margin darker yellow, with an undulating narrow thread-like black line, losing itself towards the exterior extremity. In the centre is the eye, peculiar to all saturniæ, with micaceous transparency, triangular, with the sharp angle towards the body, another small oblong transparent point behind it, both with a dark brownish margin round it. *Inferior* or *second pair*, in point of distribution of colors the same; in form, much more convex, oblong. The hair very thick and long towards the body, and more particularly towards the point of insertion. The black line is not undulated, but follows the shape of the wing, and has at each side of the projecting tendons two black oblong spots, circumscribed with light yellow.

Habitat in the Cassia mountains in *Silhet* and *Dacca*, where its large cocoons are spun to silk. A particular description of the process is wanted.

5. A still larger *Saturnia*, one of the greatest moths in existence, measuring ten inches from the end of one wing to the other, observed by J. W. GRANT, Esq. in *Chirra Punjee*, seen in the possession of the late Dr. JAMES CLARK. I have not yet seen the animal.

6. *Saturnia Paphia*, Linn. Syst. Nat. 2, p. 809, 4. *Phalæna Mylitta*, DRURY, vol. ii. t. 5, f. 1, Mar. ROXB. Trans. Linn. Soc. vol. vii. p. 33.

The Tusseh Silkworm.

It is the most common in use of the native silkworms. The cloth so commonly worn by Europeans also in this country, comes from this species; J. W. GRANT, Esq. had the kindness to procure me, in

the month of September, more than 3000 cocoons, which I permitted to slip out, and had ample opportunity of studying them.

MICHAEL ATKINSON, Esq. from *Jangypur* says, that this species cannot be domesticated, because the moths take flight, before the females are fecundated. This is against my experience : I kept them under a musquito curtain to prevent their evasion, there they were impregnated readily by the males, and deposited every where many thousand eggs, and the young caterpillars issued the tenth day. Therefore the fear entertained of the difficulty in this respect seems to be easily overcome.

Hitherto has this silkworm never been reared, but millions of cocoons are annually collected in the jungles and brought to the silk factories near *Calcutta*, for instance *Dhaniakhali* ; but the principal place of their manufacture is at *Bhagelpur*. In other parts as at *Jangypur* the people gather them from the trees and transplant them on the Assem tree, (*Terminalia alata*, ROXB.) which growing near the houses enables them easily to watch the caterpillars, which are eagerly searched out and devoured in the day time by crows, and at night by bats, &c.

The natives distinguish two varieties, the bughy and the jaroo, but they are the same species.

They feed most commonly in the wild state on the bair tree, (*Zizyphus jujuba*,) but like also and indeed prefer the *Terminalia alata* and *Bombax heptaphyllum*.

This is the same moth which is also found sometimes in *Assam* and which Mr. HUGON calls *Kontkuri mooga*.

Though it was known in *Europe* by the publications of Dr. ROXBURGH and Dr. BUCHANAN, that the *Tusseh* and *Arrindy* silkworms are existing and indigenous, yet, strange enough, it was hitherto unknown, (at least with us on the continent,) that for some years past, their silk was only in small quantity exported to *England*; this silk having been considered as an inferior quality to that produced by *Bombyx mori*. The question of the possibility of acclimation of these larvæ in other congenial climates has ex ipso never been raised.

7. Another *Saturnia* distinct from all others (alis inferioribus in caudam desinentibus) ; it resembles some species which I saw brought from *Seva*, ? *Java*.

I could only procure the wings of this remarkable insect.

The moth comes from the neighborhood of *Comercolly*.

8. *Saturnia Assamensis*, (mihi.)—Long. alar. sup. extensarum 60—65 linear.

Diagn. Pectinicornis, alis superioribus apice acutis subfalcatis, in inferioribus subtriangularibus maculis duabus subcircularibus non diaphanis luteis. Color lateritis—luteus, nebulis sparsis obscuris lineis semicircularibus versus corpus duabus albis fasciâ albidâ brunneâ versus marginem inferiorem.

Eggs, larva, and chrysalis, not seen living, but recognizable in the accompanying drawing. (See *Moonga moth*, Plate VI.)

Head, not projecting, with a tuft of reddish yellow hair.

Eyes, ordinary dark-brown.

Antennæ, pectinated in ♀, broader than usual in Saturniæ.

Palpi, four, covering the mouth which is invisible.

Thorax, square, half oblong, clothed near the head in a silverish grey color, forming a continuity of that in the upper margin of the superior wings, the behind part of the color of the wings.

Abdomen, more than two-thirds of the breadth of both wings in their natural position, likewise of the color of the wings.

Legs, slender, hairy, yellow, short.

Tarsi, slight and incurved.

Wings, horizontally expanded, with a strong tendon directing the membrane of the upper wings in their upper margin.

Both pairs of a dark yellow somewhat reddish color. The end in the male much curved, the upper margin half from the body, of a silver grey color. The exterior extremity scarcely differently marked; a brown slightly undulated band, accompanied on both sides by a white line, extends across the wings more than two-thirds below their insertion on the thorax. Several brown nuberculæ are to be observed between the divisions of each tendon. Two semilunar white lines are to be observed on the upper wings, and are absolutely on the lower ones towards the abdomen; the interior larger, inwards curved; the other shorter, outward bound. The two specks on the wings, peculiar to *Saturnia*, are almost semicircular, but not micaceous, diaphanous; but likewise clothed with yellow squamæ of a darker line (more in ♀) with a brown margin on the inner side. Through this distinguishing peculiarity this insect seems to make a transit to a next genus, though the drawing of the larva represents completely a *saturnia* caterpillar.

The cocoon of a yellow brown color differs in appearance from all the others.

We are indebted for the discovery of this very interesting insect to Captain JENKINS and Mr. HUGON. Its particulars are extensively described in Mr. HUGON's memorandum. This species has never been mentioned before, though the fabrication of silk from it seems to be very common amongst the Assamese.

9. *Phalæna Cynthia*, DRURY, 2, t. 6, f. 2. Cram. 4, t. 39, f. 4.

ROXB. Linn. Trans. vol. vii. p. 42. BUCHANAN,
Desc. Dinájpur, p. 214.

(BUCHANAN quotes it as *Phalæna Penelope* unde?)

The *Arrindy Arria*, or *Eria* silkworm (Pl. V.) is reared over a great part of Hindustan, but more extensively in the districts of *Dinájpur* and *Rangpur*, in houses, in a domesticated state, and feeds chiefly on the leaves of *Ricinus communis*.

The silk of this species has hitherto never been wound off, but people were obliged to spin it like cotton.

“It gives a cloth of seemingly loose coarse texture, but of incredible durability; the life of one person being seldom sufficient to wear out a garment made of it, so that the same piece descends from mother to daughter.”—(*Atkinson's letter to Roxburgh.*)

It is so productive as to give sometimes 12 broods of spun silk in the course of the year. The worm grows rapidly, and offers no difficulty whatever for an extensive speculation.

On account of the double profit which would be derived from the same area of land cultivating it with castor-oil plant, which produces oil and feeds the worm, an extensive cultivation of this species would be highly recommendable; and if also the cloth is of the coarsest nature, it is, on the other hand, very valuable on account of its durability. May it not be particularly well adapted to mix it in certain textures with cotton?

It is likewise an inhabitant of *Assam*, and Mr. HUGON's observations about this species form an interesting paragraph in his memorandum.

10. *Saturnia* (?) *trifenestrata*, mihi.—Longitudo lineas 24—28.
Diagnosis. ♀ obscure castaneo brunneâ versus finem albedo adpersâ, lineâ transversali albidâ, alis superioribus ad marginem externam fenestris tribus transparentibus lineâ diagonali versus corpus currentibus.

♂ luteus lineâ brunneâ transversali transversè super alas currente, alæ superiores margine externo fuscæ.

Eggs, whitish-yellow; indented 1 line on the longer circumference.

Larva, unknown.

Chrysalis, unknown, (damaged.)

Cocoon, yellow, in a network, transparent, so that the cocoon in the inside is to be seen, of a remarkable silky lustre.

Imago. ♀ of an uniform brown color; towards the end of the wings the like with white flower powdered. An obsolete whitish line runs transversely. The most remarkable in this insect are three glass eyes on the upper wings, beginning from the tendon of the insertion lower than the middle of the wing, and running one behind the other inwards

towards the extremity of the body. The first looks like two, which run together, the second is the smallest.

† of a uniform yellow color, only the outward margin of the wings is brownish, and a transversal line turns over the wings. The glass eyes are wanted, one of the three is a vestige, instead of the two others are two brown spots to be observed.

In those specimens which I saw were gradual transitions from dark brown to light yellow in different individuals to be observed, but always were the females much darker.

This is likewise a valuable discovery of Captain JENKINS in *Assam*, where it lives on the soon tree, but seems to be not much used.

11. HENRY CREIGHTON, Esq. of *Malda*, mentions another silkworm :—

“There is a cocoon produced wild upon the mango tree, which the people of *Malda* gather and mix with *Arrindy* cocoons in spinning.” This species seems to have remained hitherto unobserved.

There is no doubt, that in India exist some more insects, which furnish this precious material. The repeated and so often frustrated endeavours of ingenious men in *Europe* would certainly find in India an ample and highly remunerating field in this branch of speculation.

It would be very interesting to collect all moths which form cocoons, amounting, to judge by analogy, probably to upward of 150 species, to watch their natural economy, and to send specimens of each cocoon to *Europe*, to be there attentively examined.

Many have made the objection that the silk of the Indian species is much inferior.

This is yet an undecided question. The mulberry silkworm degenerates if not properly attended to. What has been done to raise the indigenous species from the state of their natural inferiority? Very much depends upon the cultivation of the worms in houses; 2, the method of feeding them, selecting that vegetable substance, not which gratifies the best their taste, but which contributes to form a finer cocoon; and 3, from the first chemical operations employed before the working of the rough material. But even if the raw material would not be capable of a higher degree of cultivation, the demand for it would, notwithstanding, never cease in *Europe*. All silk produced in Hindustan has hitherto found a ready and profitable market in *Calcutta*, and the demand is always greater than the supply. And that really the roughest stuff of the *Arrindy* silkworm is appreciated in *England*, may I be permitted to conclude the present article with the following fact.

Mr. JOHN GLASS, the Surgeon of *Baglipur*, sent, in the beginning of this century, some of the *Arrindy* silk home, and he wrote :

“ I understand that some manufacturers to whom it was shown seemed to think that we had been deceiving them by our accounts of the shawls being made from the wool of a goat, and that this silk if sent home would be made into shawls equal to any manufactured in India.”

This will be sufficient to show the importance of this article, and that it merits highly the attention of the paternal Government of India, and of all patriotic institutions, particularly of the Asiatic Society in *Calcutta*, which has done hitherto so much for the promotion of science and knowledge, and consequently for the welfare of all nations.

V.—*Concerning certain interesting Phenomena manifested in individuals born blind, and in those having little or no recollection of that sense, on their being restored to sight at various periods of life. By F. H. BRETT, Esq. Med. Serv.*

When the profound and discerning Mr. LOCKE in his *Essay on the Human Understanding* asserted that ideas were not innate, he meant, no doubt, that so far as the mind's intercourse, in its present condition, with all objects submitted to it was concerned, its noble faculties were destined to be educated only by its legitimate objects of excitation through the medium of the senses appointed for that purpose. His eccentric comparisons of the mind to a dark room, a blank sheet of paper, &c., meant in reality nothing further.

It occasionally happens that in the course of very extensive practice we have opportunities of illustrating this, in cases of restoration to sight of persons born blind, and also in cases of individuals who have known and distinguished colors; and “ then (as Mr. LOCKE expresses it) cataracts shut the windows,” and if restored to sight many years afterwards, they are in precisely the same situation as though they had never seen before, having not the slightest recollection or idea of colors any more than the individuals born blind. All is to be acquired “ *de novo*.”

I will particularize the following from amongst several which have occurred to me, as they may probably appear interesting to the Society when divested of all purely professional or surgical detail, which have already indeed been communicated to the profession.

No. 1.—The following is illustrative of the fact of all ideas of objects and colors having to be acquired, as well as a verification of the problem